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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the structure of image formation equipment.
[0002]
[Description of the Prior Art] Conventionally, two kinds, the source of a thermoelectron and a cold cathode electron source, are known as an electron emission element. There are a field emission type (it abbreviates to FE type below), a metal / insulating layer / metal mold (it abbreviates to an MIM type below), a surface conduction type electron emission element, etc. in a cold cathode electron source. As an FE type example, it is W.P.Dyke. & W.W.Dolan, "Field emission", Advance in Electron Physics, 8 89 (1956) or C.A.Spindt, "Physical Properties of thin-film field emission cathodes with molybdenium", J.Appl.Phys., 47 5248 (1976) etc. is known. As an MIM type example, they are C.A.Mead and "The. tunnel-emission amplifier, J.Appl.Phys., 32 646 (1961) etc. is known. As a surface conduction type electron emission element type example, they are M.I.Elinson and RadioEng. Electron There are Phys., 10 (1965), etc. A surface conduction type electron emission element uses the phenomenon which electron emission produces for the thin film of the small area formed on the substrate by passing current in parallel with a film surface. As this surface conduction type electron emission element, it is SnO2 by aforementioned Elinson etc. The thing using the thin film, Thing [G. depended on Au thin film Dittmer:"Thin Solid Films", 9 317(1972)], and In 2O3 / SnO2 Thing [M. depended on a thin film Hartwell and C.G.Fonstad:"IEEE Trans. ED Conf.", 519(1975)] and thing [depended on a carbon thin film -- Araki ** others -- : -- a vacuum, the 26th volume, No. 1, 22-page (1983)], etc. are reported Above-mentioned M. Hartwell's element composition is shown in drawing 17 as typical element composition of these surface conduction type electron emission elements. In this drawing, 201 is a substrate. 204 is a conductive thin film, it consists of a metallic-oxide thin film formed in the pattern of H type configuration by the spatter, and the electron emission section 205 is formed of the energization processing called below-mentioned energization foaming. 0.5-1mm and W" are set up for element electrode spacing L' in drawing by 0.1mm. The position and configuration of the electron emission section 205 were shown typically.
[0003] Conventionally, before performing electron emission in these surface conduction type electron emission elements, it was common to have formed the electron emission section 205 by energization processing beforehand called energization foaming in the conductive thin film 204. that is, with energization foaming, impression energization of the minute is carried out to the ends of the aforementioned conductive thin film 204 in direct current voltage or about ****** /, for example, 1v, carried out very slowly, and a conductive thin film is destroyed, deformed or deteriorated locally -- making -- electric -- high -- it is forming the electron emission section 205 changed into the state [****] In addition, a crack generates the electron emission section 205 in a part of conductive thin film 204, and electron emission is performed from near [the] a crack. The surface conduction type electron emission element which carried out the aforementioned energization foaming processing impresses voltage to the above-mentioned conductivity thin film 204, and makes an electron emit from the above-mentioned electron emission section 205 by passing current for an element.
[0004] An above-mentioned surface conduction type discharge element has the advantage to which structure can carry out array formation of many elements ranging from it being simple and manufacture being easy to a large area. Then, various application in which this feature can be employed efficiently is studied. For example, display, such as a source of an electric charge beam and image display equipment, is raised.
[0005] In the above-mentioned display, common practice, such as natural thermolysis and forced-air cooling, is used about the method of radiating generation of heat of the display panel accompanying the energization to an electron emission element etc.
[0006]
[Problem(s) to be Solved by the Invention] However, by common practice like natural thermolysis of the above-mentioned conventional technology, or forced-air cooling, the following point has posed a problem in recent years with enlargement and thin-shape-izing of flat-surface type image display equipment.
(1) Efficient cooling of a display panel cannot be performed, but with the heat generated in the electron emission element section with a drive, a thermal strain occurs in a display panel and the reliability as equipment becomes low.
(2) Spaces for installation, such as a radiation fin for thermolysis of a display panel and an air-cooling fan, become the hindrance of thin-shape-izing.
[0007] this invention aims at offering the image formation equipment which solved the above-mentioned trouble.
[0008]

[Means for Solving the Problem] The tooth-back board which allotted the electron emission element section for which this invention used "electron emission element in order to solve the above-mentioned technical problem, The frame of the front board which countered with the aforementioned electron emission section and allotted the image formation section, and the aforementioned tooth-back board and the aforementioned front board which does and surrounds the aforementioned electron emission element section and the image formation section Are image formation equipment which has the display panel which carried out sealing sealing by sealing material, and it has the area in which the aforementioned tooth-back board projects from the periphery of the aforementioned frame. It is what offers the image formation equipment characterized by contacting and installing the heating component which heats this portion in the area portion which projected from the outside the limit periphery." (1) Are in contact with the portion in which the aforementioned heating component consisted of a heat-conduction member in contact with the electrical part generating heat and its electrical part, and the heat-conduction member carried out [aforementioned] the protrusion, The electrical part to which (2) and (1) generate heat being attached on an electric substrate, and the (3) aforementioned heating component with the portion which projected from the above and the outside the limit periphery of a tooth-back board Are in contact with being contacted and installed also in an outside the limit wall, the portion in which the heating component of (4) and (3) consisted of a heat-conduction member in contact with the electrical part generating heat and its electrical part, and the heat-conduction member carried out [aforementioned] the protrusion, and the outside the limit wall, (5) It includes that the aforementioned electron emission element is a surface conduction type electron emission element and that the electrical circuit substrate of (6) and (2) is an electrical circuit substrate for a display-panel drive.
[0009] According to this invention, equalization of the temperature of a display panel, especially a tooth-back board is achieved. Moreover, it becomes unnecessary to use a radiation fin and an air-cooling fan for a display panel.
[0010]
[Embodiments of the Invention] Next, the image formation equipment of this invention is explained using drawing 1 or drawing 3 . Drawing 1 is the plan of a display-panel unit, and, as for 1, the display panel 10 a front board and whose 20 the image formation section and 3 are wiring a tooth-back board and 5, and are airtight containers from the front board 2, the tooth-back board 3, and a frame (un-illustrating) is formed, as for a display-panel unit and 2. Wiring 5 is used in order to supply the driving signal from an electrical circuit substrate to the electron emission element on the tooth-back board 3. The image formation portion 20 prepared inside the display panel 10 forms a picture by the electron emitted from a discharge element. Next, it explains using drawing 2 which is AA cross section of drawing 1 .
[0011] the cross section of the display-panel unit with above-mentioned drawing 2 -- it is -- 1 -- a display-panel unit and 10 -- a display panel and 2 -- a front board and 20 -- the image formation section and 3 -- a tooth-back board and 30 -- the electron emission element section and 4 -- a frame and 5 -- wiring and 6 -- an electrical circuit substrate and 7 -- an exoergic electrical part and 8 -- an electrical part and 9 -- heat conduction -- it is a member
[0012] The display panel 10 which is an airtight container is formed from the front board 2, the tooth-back board 3, and the frame 4, and it is prepared in the interior so that the electron emission element section 30 may counter on the image formation section 20 and the tooth-back board 3 on the front board 2. The electrical part 7 which generates heat on the electrical circuit substrate 6 is mounted outside the electron emission element section 30, and the other electrical parts 8 are mounted inside. the mechanical connections of the electrical circuit substrate 6 and a display panel 10 -- electrical-part 7 portion -- setting -- heat conduction -- it carries out by the member 9 and wiring 5 performs electrical installation of the electrical circuit substrate 6 and a display panel 10

[0013] A driving signal is transmitted from the electrical circuit substrate 6 to the electron emission element section 30 on the tooth-back board 3 of a display panel 10 through wiring 5, an electron is emitted from an electron emission element, and a picture is formed in the image formation section 20. The display unit 1 is held into a tank and image formation equipment is done.
[0014] Drawing 3 is drawing showing the display panel of the above-mentioned display-panel unit, and the relation of an electrical circuit substrate, and it is the electrical part (for example, what carries out signal processing, the thing which makes a reference signal) in which 10 does not have the electrical part (for example, what passes a high current, the thing which high pressure joins, the thing to switch) to which a tooth-back board and 4 generate heat in the image formation section and 3, and an electrical circuit substrate and 7 generate heat in a frame and 6, and 8 do have comparatively other generation of heat The display panel is formed from the front board 2, the tooth-back board 3, and the frame 4, and the image formation section 20 is formed in the interior on the front board 2. The electrical part 7 which generates heat on the electrical circuit substrate 6 is mounted in a periphery, and the other electrical parts 8 are mounted inside.
[0015] The electron emission element used by this invention has simple composition, and a surface conduction type electron emission element with an easy process is suitable for it. As for a surface conduction type electron emission element, two kinds, a flat-surface type surface conduction type electron emission element and a vertical-type surface conduction type electron emission element, are raised fundamentally.
[0016] It is typically shown in drawing 6 (a) and (b) by using composition of a fundamental surface conduction type electron emission element as a plan and a cross section. For 101, as for an element electrode and 104, in drawing 6 , a substrate, and 102 and 103 are [a conductive thin film and 105] the electron emission sections. As a substrate 101, it is glass with few impurity contents, such as quartz glass and Na, blue sheet glass, and SiO2. Ceramic substrates, such as a glass substrate formed in the front face and an alumina, are used. the printed conductor which a general conductor is used as a material of the element electrodes 102 and 103, for example, consists of a metal, a metallic oxide, glass, such as metals, such as nickel, Cr, Au, Mo, W, Pt, Ti, aluminum, Cu, and Pd, or an alloy and Pd, Ag, Au and RuO2, and Pd-Ag, etc., and In2 O3-SnO2 etc. -- it is suitably chosen from

semiconductor materials, such as a transparent conductor and contest polysilicon The element electrode spacing L is 100 micrometers of numbers from hundreds of A preferably. Moreover, the voltage impressed to element inter-electrode has a desirable method of a low, and since to create with sufficient reappearance is demanded, a desirable element electrode spacing is 10 micrometers of numbers from several micrometers. Element electrode length W is 100 micrometers of numbers from several micrometers from the resistance of an electrode, and the electron emission characteristic, and several micrometers of the thickness of the element electrodes 102 and 103 are more desirable than hundreds of A. In addition, you may make it the composition in which the electrode of the conductive thin film 104 and the element electrodes 102 and 103 was made to form in order on a substrate 101 instead of the composition of drawing 6 (b).

[0017] The conductive thin film 104 has especially the desirable particle film that consisted of particles, in order to obtain the good electron emission characteristic, and although the thickness is suitably set up according to resistance, energization foaming conditions mentioned later between the step coverage to the element electrodes 102 and 103, the element electrode 102, and 103, it is 1000A of numbers from several angstroms preferably, and is 500A from 10A especially preferably. The sheet resistance is the cube of 10, or a 7th power ohm /[of 10] ** (ohm/Sq.). The material which constitutes the conductive thin film 104 Pd, Pt, Ru, Ag, Au, Metals, such as Ti, In, Cu, Cr, Fe, Zn, Sn, Ta, W, and Pb, PdO, SnO2, In 2O3, PbO, and Sb 2O3 etc. -- an oxide -- HfB2, ZrB2, LaB6, CeB6, YB4, and GdB4 etc. -- semiconductors, such as nitrides, such as carbide, such as a boride, and TiC, ZrC, HfC, Tac, SiC, WC, and TiN, ZrN, HfN, and Si, germanium, carbon, etc. are raised In addition, not only the state that the particle distributed separately but a particle gets down from the film in contiguity or the state (the shape of an island is also included) where it overlapped very mutually as the fine structure, the above-mentioned particle film is a film with which two or more particles gathered, and it is [the particle size of a particle is 1000A of numbers from several angstroms, and] 200A from 10A preferably.

[0018] The electron emission section 105 is the crack of high resistance formed in a part of conductive thin film 104, and is formed of energization foaming etc. Moreover, in a crack, it may have the conductive particle of the particle size of 100A of numbers from several angstroms. This conductive particle contains some [at least] elements of the matter which constitutes the conductive thin film 104. Moreover, the electron emission section 105 and the conductive thin film 104 of the near may have carbon and a carbon compound.

[0019] Next, it is shown in drawing 7 by using composition of a fundamental vertical-type surface conduction type electron emission element as a typical cross section. In drawing 7 , the same sign is given about the same component as drawing 6 . 111 is the level difference formation section. A substrate 101, the element electrodes 102 and 103, the conductive thin film 104, and the electron emission section 105 can be constituted from the same material as the flat-surface type surface conduction type electron emission element mentioned above, the level difference formation section 111 consists of insulating material, and the thickness of the level difference formation section 111 is equivalent to the element electrode spacing L of the flat-surface type surface conduction type electron emission element described previously. The interval is 10 micrometers of numbers from hundreds of A. Moreover, although the interval is controllable by the voltage impressed to the process of the level difference formation section, and element inter-electrode, it is several micrometers from hundreds of A preferably. In order to form the conductive thin film 104 after the element electrodes 102 and 103 and level difference formation section 111 creation, the laminating of it is carried out on the element electrodes 102 and 103. In addition, although it is indicated that the electron emission section 105 is formed in the level difference formation section 111 in the shape of a straight line in drawing 7 , depending on creation conditions, energization foaming conditions, etc., a configuration and a position are not restricted to this.

[0020] Although there are various methods as the manufacture method of an above-mentioned surface conduction type electron emission element, the example is shown in drawing 8 . Hereafter, the production method of an electron-source substrate is explained based on drawing 6 and drawing 8 . In addition, in drawing 8 , the same sign is given about the same member as drawing 6 .

[0021] 1) Deposit a substrate by the detergent, pure water, and the organic solvent, and fully deposit an element electrode material by the vacuum deposition method, the spatter, etc. after washing. Then, the element electrodes 102 and 103 are formed on this substrate with photo lithography technology (drawing 8 (a)).
 [0022] 2) Form an organic-metal thin film by applying and leaving an organic-metal solution in the substrate 101 which formed the element electrodes 102 and 103. An organic-metal solution here is a solution of the organometallic compound which uses as the main element the metal which forms the above-mentioned conductive film 104. Then, heating baking processing of the organic-metal thin film is carried out, patterning is carried out by the lift off, etching, etc., and the conductive thin film 104 is formed (drawing 8 (b)). In addition, although explained by the method of applying an organic-metal solution here, it cannot restrict to this and can also form by a vacuum deposition method, a spatter, the modified chemical vapor deposition, the distributed applying method, the dipping method, the spinner method, etc.

[0023] 3) Perform energization processing which continues and is called energization foaming. Energization foaming energizes using a non-illustrated power supply, makes the conductive thin film 104 break, deform or deteriorate locally, and makes the part to which structure was changed form between the element electrode 102 and 103. This part made to change structurally locally is called electron emission section 105 (drawing 8 (c)). The example of the voltage waveform of energization foaming is shown in drawing 9 . Especially a voltage waveform has a desirable pulse shape, and it may impress a voltage pulse, making the case (drawing 9 a) where a voltage pulse with a fixed pulse height value is impressed continuously, and a pulse height value increase. The case (drawing 9 a) where a pulse height value considers as fixed voltage first is explained.

[0024] T1 and T2 in drawing 9 a are the pulse width and pulse separation of a voltage waveform, and T1 is made into 1

microsecond - 10 ms, they make T2 10 microseconds - 100 ms, and the peak value (peak voltage at the time of energization foaming) of a triangular wave is suitably chosen according to the form of a surface conduction type electron emission element, and is impressed from several seconds for number 10 minutes under the vacuum atmosphere of a suitable degree of vacuum, for example, ten 5th [-] power torr grades. In addition, the wave impressed to inter-electrode [of an element] may not be limited to a triangular wave, and may use the wave of requests, such as a square wave. T1 and T2 in drawing 9 b -- drawing 9 a -- the same -- the peak value (peak voltage at the time of energization foaming) of a triangular wave -- 0.1 [for example,] -- you make it increase about V steps at a time, and it impresses under a suitable vacuum atmosphere In addition, when the energization foaming processing in this case is the voltage of the grade which does not break locally and does not transform the conductive thin film 104, for example, about [0.1V] voltage, element current is measured, and resistance is calculated, for example, resistance beyond 1M ohm is shown in pulse separation T2, it is considered as an energization foaming end.

[0025] 4) It is desirable to perform processing called activation process to the element which energization foaming next ended. It is the processing to which an activation process is a degree of vacuum for example, about [10] power [4th / -] - 10 to 5th power torr, the carbon and/or the carbon compound which are the thing of the processing which a pulse height value repeats a fixed voltage pulse like energization foaming, and is impressed, and originate in the organic substance which exists in a vacuum are made to deposit on an electric conduction thin film, and element current If and the emission current Ie are changed remarkably. Measuring element current If and the emission current Ie, an activation process is ended, for example, when the emission current Ie is saturated. Moreover, as for the voltage pulse to impress, it is desirable to carry out by driver voltage of operation. Carbon and/or a carbon compound are graphite (both ** and polycrystal are pointed out) amorphous carbon (mixture with amorphous carbon and polycrystal graphite is pointed out) etc., and the thickness has desirable 500A or less, and they are 300A or less more preferably here.

[0026] 5) In this way, it is good to put the created electron emission element on the bottom of the atmosphere of a degree of vacuum higher than the degree of vacuum in an energization foaming process and an activation process, and to carry out a drive of operation. Furthermore, under the atmosphere of a high degree of vacuum, it is desirable at 80 degrees C - 150 degrees C to carry out an after [heating] operation drive. In addition, it is about 10 degree of vacuum of the 6th [-] power or more, and a degree of vacuum higher than an energization foaming process and the degree of vacuum which carried out activation is an ultra-high-vacuum system more preferably, and is a degree of vacuum which carbon and a carbon compound newly deposit hardly on an electric conduction thin film. It becomes possible by carrying out like this to stabilize element current If and the emission current Ie.

[0027] The outline block diagram of the measurement evaluation equipment for measuring the electron emission characteristic of an element which has the composition shown by drawing 6 is shown in drawing 10 . In drawing 10 , the same sign as drawing 6 shows the same thing. The ammeter for the power supply for 121 impressing the element voltage Vf to an electron emission element and 120 measuring the element current If which flows the conductive thin film 104 between the element electrodes 102.103, The anode electrode for 124 catching the emission current Ie emitted from the electron emission section of an element, As for the ammeter for the high voltage power supply for 123 impressing voltage to the anode electrode 124 and 122 measuring the emission current Ie emitted from the electron emission section 105 of an element, and 125, vacuum devices and 126 are exhaust air pumps.

[0028] Next, the image formation equipment of this invention is described. The electron-source substrate used for image formation equipment is formed by arranging two or more surface conduction type electron emission elements on a substrate. To the method of the array of a surface conduction type electron emission element, a surface conduction type electron emission element is arranged in parallel, and the ladder type arrangement (the following carries out and calls it a mold arrangement electron-source substrate) which connects the ends of each element with wiring, and the simple matrix arrangement (it is called below a matrix type arrangement electron-source substrate) which connected the direction wiring of X and the direction wiring of Y to the element electrode of the couple of a surface conduction type electron emission element, respectively are raised. The control electrode (grid electrode) which is an electrode which controls flight of the electron from an electron emission element is needed for the image formation equipment which has a ladder type arrangement electron-source substrate.

[0029] Hereafter, the composition of the electron source constituted based on this principle is explained using drawing 11 . For an electron-source substrate and 132, as for the direction wiring of Y, and 134, the direction wiring of X and 133 are [131 / a surface conduction type electron emission element and 135] connection. in addition, the flat-surface type or vertical type which mentioned above the surface conduction type electron emission element 134 -- you may be whichever The substrate used for the electron-source substrate 131 in this drawing is a glass substrate mentioned above, and a configuration is suitably set up according to a use. the direction wiring 132 of X of m -- Dx1, Dx2, and ... from Dxm -- becoming -- the direction wiring 133 of Y -- Dy1, Dy2, and ... it consists of wiring of n of Dyn Material, thickness, and wiring width of face are suitably set up so that voltage with these wiring almost equal for many surface conduction type elements may be supplied. Between the direction wiring 132 of X and the direction wiring 133 of Y of n of these m, it is electrically separated by the non-illustrated layer insulation layer, and matrix wiring is constituted. (Both m and n are a positive integer)

A non-illustrated layer insulation layer is formed in the field of the whole surface of the substrate 131 in which the direction wiring 132 of X was formed, or in part a request. The direction wiring 132 of X and the direction wiring 133 of Y are pulled out as an external terminal, respectively. Furthermore, the element electrode (un-illustrating) of the surface conduction type discharge element 134 is electrically connected by the direction wiring 132 of X of m, the direction wiring 133 of Y of n, and connection 135. Moreover, you may form a surface conduction type electron emission element in whichever on a substrate or a

non-illustrated layer insulation layer. Although later mentioned in detail for the aforementioned direction wiring 132 of X, it connects with a scanning signal generation means by which it does not illustrate for impressing the scanning signal for scanning the line of the surface conduction type discharge element 134 arranged in the direction of X according to an input signal, electrically. On the other hand, it connects with the direction wiring 133 of Y electrically with a modulating-signal generating means by which it does not illustrate for impressing the modulating signal for modulating each train of the train of the surface conduction type discharge element 134 arranged in the direction of Y according to an input signal. Furthermore, the driver voltage impressed to each element of a surface conduction type electron emission element is supplied as difference voltage of the scanning signal impressed to the element concerned, and a modulating signal. By the above-mentioned composition, only by simple matrix wiring, an individual element is chosen and a drive becomes independently possible.

[0030] The image formation equipment using the matrix type arrangement electron-source substrate created as mentioned above next is explained using drawing 12 , drawing 13 , and drawing 14 . Drawing 12 is the basic block diagram of image formation equipment, the block diagram of the drive circuit for displaying by drawing 13's embracing to a fluorescent screen and drawing 14 embracing the television signal of an NTSC color TV system is shown, and image formation equipment including the drive circuit is expressed.

[0031] As for the electron-source substrate to which 131 produced the electron emission element on the substrate in drawing 12 , the rear plate with which 141 fixed the electron-source substrate 131, the face plate by which, as for 146, the fluorescent screen 144 and the metal back 145 grade were formed in the inside of a glass substrate 143, and 142, a housing and 141 are rear plates, and an envelope 148 is constituted by these members. 134 is equivalent to the electron emission section in drawing 6 . 132 and 133 are the direction wiring of X and the direction wiring of Y which were connected with the element electrode of the couple of a surface conduction type electron emission element.

[0032] Although the envelope 148 constituted the envelope 148 from a face plate 146, a housing 142, and a rear plate 141 like ****, since the rear plate 141 is formed in order to mainly reinforce the intensity of the electron-source substrate 131, when it has intensity sufficient by electron-source substrate 131 the very thing, its rear plate 141 of another object is unnecessary, it may form the direct housing 142 in the electron-source substrate 131, and may constitute an envelope 148 from a face plate 146, a housing 142, and an electron-source substrate 131.

[0033] 152 in drawing 13 is a fluorescent substance. In the case of the fluorescent screen of a color, a fluorescent substance 152 consists of the black electric conduction material 151 and fluorescent substances 152 which are called a black stripe or black matrix by the array of a fluorescent substance, although it consists only of a fluorescent substance in the case of monochrome. The purpose in which a black stripe and a black matrix are prepared is suppressing the fall of the contrast by the outdoor daylight reflection in it not being conspicuous and carrying out color mixture etc. by distinguishing by different color between each fluorescent substance 152 of a needed three-primary-colors fluorescent substance with in the case of color display, and making the section black, and a fluorescent screen 144. Although the material which usually makes a graphite a principal component is well used as a material of a black stripe, there is conductivity, and if transparency and reflection of light are a few material, it will not restrict to this. The method of applying a fluorescent substance to a glass substrate 143 is not based on monochrome and a color, but a precipitation method and print processes are used. Moreover, the metal back 145 (drawing 12) is usually formed in the inside side of a fluorescent screen 144 (drawing 12). The metal back's purpose is protection of the fluorescent substance from the damage by the collision of the anion generated within acting as an electrode for impressing improving brightness and electron beam acceleration voltage and the envelope etc. by carrying out specular reflection of the light by the side of an inside to a face plate 146 side among luminescence of a fluorescent substance. The metal back performs data smoothing (usually called filming) of the inside side front face of a fluorescent screen after fluorescent-screen production, and it can produce by depositing aluminum with vacuum deposition etc. after that. In order to raise the conductivity of a fluorescent screen 144 to a face plate 146 further, you may prepare a transparent electrode (un-illustrating) in the superficies side of a fluorescent screen 144. An envelope 148 is made into the degree of vacuum about torr the 10 to 7th power through a non-illustrated exhaust pipe, and closure is performed. Moreover, getter processing may be performed in order to maintain the degree of vacuum after closure of an envelope 148. This is processing which heats the getter arranged at the position in an envelope 148 (un-illustrating), and forms a vacuum evaporationo film by the heating methods, such as resistance heating or high-frequency heating, after closure, just before closing an envelope 148. Ba etc. is usually a principal component and a getter maintains the degree of vacuum of for example, 1x10 torr or the 7th [-] power of ** torr the 1x10 to 5th power by the absorption of this vacuum evaporationo film. In addition, the process after foaming of a surface conduction type electron emission element is set up suitably.

[0034] Next, the outline composition of the drive circuit for performing a television display for the image formation equipment constituted using the matrix type arrangement electron-source substrate based on the television signal of an NTSC color TV system is explained using the block diagram of drawing 14 . 161 -- the aforementioned display panel -- it is -- 162 [moreover,] -- for a shift register and 165, line memory and 166 are [a scanning circuit and 163 / a control circuit and 164 / a modulating-signal generator, and Vx and Va of a synchronizing signal separation circuit and 167] direct current voltage supplies

[0035] Hereafter, the function of each part is explained. A display panel 161 is a terminal Dox1. Or Doxm And terminal Doy1 Or Doyn And it has connected with an external electrical circuit through a secondary terminal Hv. among these, terminal Dox1 Or Doxm **** -- the surface conduction type electron emission elements by which matrix wiring was carried out at the letter of a matrix of the electron source prepared in the aforementioned image formation equipment, i.e., an M line N train, -- every [a party (N elements)] -- the scanning signal for driving one by one is impressed

[0036] On the other hand, the modulating signal for controlling the output electron beam of each element a party's surface

conduction type electron emission element chosen by the aforementioned scanning signal is impressed to a terminal Dy1 or Dyn. Moreover, although the direct current voltage of 10 [kV] is supplied to a secondary terminal Hv from direct current voltage supply Va, this is the acceleration voltage for giving sufficient energy exciting a fluorescent substance to the electron beam outputted from a surface conduction type electron emission element.

[0037] Next, a scanning circuit 162 is explained. This circuit equips the interior with M switching elements, and each switching element chooses the output voltage of direct current voltage supply Vx, or either of 0 [V] (grand level) (S1 or Sm shows typically among drawing), and it connects with the terminal Dx1 of a display panel 161, or Dxm electrically. S1 Or Sm Although each switching element operates based on the control signal Tscan which a control circuit 163 outputs, it can be constituted by combining an actual for example, switching element like FET.

[0038] In addition, the aforementioned direct current voltage supply Vx are set up so that fixed voltage which the driver voltage impressed to the element which is not scanned based on the property (electron emission threshold voltage) of the aforementioned surface conduction type electron emission element turns into below electron emission threshold voltage may be outputted.

[0039] A control circuit 163 has the work which adjusts operation of each part so that a suitable display may be performed based on the picture signal inputted from the exterior. Based on the synchronizing signal Tsync sent from the synchronizing signal separation circuit 166 explained below, each control signal of Tscan, Tsft, and Tmry is generated to each part.

[0040] The synchronizing signal separation circuit 166 can be constituted if a frequency-separation (filter) circuit is used in the circuit for separating a synchronizing signal component and a luminance-signal component from the television signal of an NTSC color TV system inputted from the outside. Although the synchronizing signal separated by the synchronizing signal separation circuit 166 consisted of the vertical synchronizing signal and the horizontal synchronizing signal so that it might be known well, it was illustrated as a Tsync signal after [expedient] explaining here. On the other hand, this signal is inputted into a shift register 164 although the luminance-signal component of the picture separated from the aforementioned television signal is expressed as a DATA signal for convenience.

[0041] A shift register 164 operates based on the control signal Tsft with which it is and is sent for carrying out serial/parallel conversion of the aforementioned DATA signal inputted serially for every line of a picture from the aforementioned control circuit 163. (That is, you may put it in another way as a control signal Tsft being the shift clock of a shift register 164.) The data for the picture of one line by which serial/parallel conversion was carried out (it is equivalent to the drive data for N electron emission elements) are outputted from the aforementioned shift register 164 as N parallel signals of Id1 or Idn.

[0042] The line memory 165 is the storage for during required time memorizing the data for the picture of one line, and memorizes the contents of Id1 or Idn suitably according to the control signal Tmry sent from a control circuit 163. The memorized contents are outputted as Id1 or Idn, and are inputted into the modulating-signal generator 167.

[0043] The modulating-signal generator 167 is a source of a signal for carrying out the drive modulation of each of a surface conduction type electron emission element appropriately according to the aforementioned image data Id1 or each of Idn, and the output signal is a terminal Doy1. Or Doyn It leads and is impressed by the surface conduction type electron emission element in a display panel 161.

[0044] The electron emission element in connection with this invention has the following basic properties to the emission current Ie. That is, there is a clear threshold voltage Vth in electron emission, and only when the voltage more than Vth is impressed, electron emission arises. To the voltage more than an electron emission threshold, the emission current also changes according to change of the applied voltage to an element. In addition, although the degree of change of the emission current to the value and applied voltage of the electron emission threshold voltage Vth may change by changing the material of an electron emission element, and composition and the manufacture method, the following can say anyway.

[0045] That is, even if it impresses the voltage below an electron emission threshold when impressing pulse-like voltage to this element for example, an electron beam is outputted, when impressing the voltage more than an electron emission threshold, although electron emission is not produced. It is possible in that case to control the intensity of an output electron beam by changing the peak value Vm of a pulse in the first place. It is possible to control the total amount of the charge of the electron beam outputted to the second by changing the width of face Pw of a pulse. Therefore, the circuit of a voltage modulation technique which modulates the peak value of a pulse suitably according to the data inputted although the voltage pulse of length fixed as a modulating-signal generator 167 is generated for a voltage modulation technique, pulse width modulation, etc. to be held, and carry out a voltage modulation technique as a method which modulates an electron emission element according to an input signal is used. Moreover, the circuit of pulse width modulation which modulates the width of face of a voltage pulse suitably according to the data inputted although the voltage pulse of fixed peak value is generated as a modulating-signal generator 167 to carry out pulse width modulation is used.

[0046] The image formation equipment of this invention can display television using a display panel 161 by a series of operation explained above. In addition, although not indicated especially during the above-mentioned explanation, the thing of a digital signal formula or the thing of an analog signal formula does not interfere, either, and, in short, as for a shift register 164 or the line memory 165, should just be performed at the rate of predetermined in serial/parallel conversion of a picture signal, or storage. Although it is necessary to digital-signal-ize the output signal DATA of the synchronizing signal separation circuit 166 when using a digital signal formula, this is possible if the output section of 166 is equipped with an A/D converter. Moreover, the circuit where the output signal of the line memory 165 is used for the modulating-signal generator 167 by the digital signal or the analog signal in relation to this becomes a different thing a little.

[0047] The case of a digital signal is described first. What is necessary is just to add an amplifying circuit etc. to the

modulating-signal generator 167 if needed using the D/A-conversion circuit known well, for example in a voltage modulation technique. Moreover, in the case of pulse width modulation, the modulating-signal generator 167 can be constituted by using the circuit which combined the comparator (comparator) which compares with the output value of the aforementioned memory the output value of the counter (counter) which carries out counting of the wave number which high-speed VCO and VCO output, and a counter. You may add the amplifier for amplifying the voltage of the modulating signal which a comparator outputs if needed and by which PDM was carried out even to the driver voltage of a surface conduction type electron emission element.
[0048] Next, the case of an analog signal is described. In a voltage modulation technique, you may add a level shift circuit etc. to the modulating-signal generator 167 if needed that what is necessary is just to use the amplifying circuit using the operational amplifier known well, for example. In the case of pulse width modulation, you may add the amplifier for amplifying the voltage even to the driver voltage of a surface conduction type electron emission element if needed that what is necessary is just to use the armature-voltage control type oscillator circuit (VCO) known well, for example.
[0049] It sets to the image formation equipment completed as mentioned above, and is the container outer edge child Dox1 in each electron emission element. Or Doxm and Doy1 Or Doyn By leading and impressing voltage, electron emission is carried out, and high pressure can be impressed to the metal back 145 or a transparent electrode (un-illustrating) through a secondary terminal Hv, an electron beam can be accelerated, it can be made to be able to collide with a fluorescent screen 144, and a picture can be displayed by making light excite and emit. The composition described above is outline composition required when producing the suitable image formation equipment used for a display etc., for example, detailed portions, such as material of each part material, are not restricted to the above-mentioned contents, and they are suitably chosen so that it may be suitable for the use of image formation equipment. Moreover, as an example of an input signal, although the NTSC color TV system was held, it may not restrict to this, and many methods, such as PAL and an SECAM system, may be used, and TV signal (for example, high-definition TV including MUSE) method which consists of much scanning lines rather than this may be used.
[0050] Next, drawing 15 and drawing 16 explain the above-mentioned ladder type arrangement electron-source substrate and the image formation equipment using it. It sets to drawing 15 , and 170 is an electron-source substrate and 171 is an electron emission element, and Dx1-Dx10 of 172. It is common wiring linked to the aforementioned electron emission element. Two or more electron emission elements 171 are arranged in parallel with the direction of X on a substrate 170. (This is called element line) . Two or more these element lines are arranged on a substrate, and it becomes a ladder type electron-source substrate. By impressing driver voltage suitably between common wiring of each element line, it becomes possible to drive each element line independently. Namely, what is necessary is just to impress the voltage below an electron emission threshold to the element line which does not make an electron beam emit the voltage more than an electron emission threshold to the element line to which an electron beam is made to emit. Moreover, for you to set common wiring Dx2-Dx9 of each element spacing to Dx2, and may be made to set Dx3 as the same wiring.
[0051] Drawing 16 is drawing for the structure of image formation equipment equipped with the electron source of ladder type arrangement being shown. the hole for a grid electrode passing 180 and an electron passing 181, and 182 -- Dox1 and Dox2 ... Doxm G1 by which the becoming container outer edge child and 183 were connected with the grid electrode 180, G2, and ... Gn from -- the becoming container outer edge child and 170 are the electron-source substrates which considered common wiring of each element spacing as the same wiring as mentioned above In addition, the same sign as drawing 12 and drawing 15 shows the same member. The difference from the image formation equipment (drawing 12) of the above-mentioned simple matrix arrangement is having the grid electrode 180 between the electron-source substrate 170 and a face plate 146.
[0052] The grid electrode 180 is formed in the middle of a substrate 170 and a face plate 146. The grid electrode 180 can modulate the electron beam emitted from the surface conduction type discharge element, and in order to make the electrode of the shape of a stripe established by intersecting perpendicularly with the element line of ladder type arrangement pass an electron beam, corresponding to each element, the hole 181 circular one piece at a time is formed. The configuration and installation position of a grid are [necessarily like drawing 16] good, and since they prepare many passage mouths in the shape of a mesh as opening, you may prepare them the circumference and near for example, the surface conduction type discharge element. The container outer edge child 182 and the grid container outer edge child 183 are electrically connected with the non-illustrated control circuit.
[0053] By impressing the modulating signal for the picture of one line to a grid electrode train simultaneously synchronizing with driving one train of element lines at a time one by one (scan), the irradiation to the fluorescent substance of each electron beam can be controlled, and it can express the picture of one line at a time as this image formation equipment. According to this invention, the image formation equipment suitable for display, such as not only the display of television broadcasting but a video conference system, a computer, etc., can be offered. It can also use also as image formation equipment as an optical printer which furthermore consisted of photosensitive drums etc. Moreover, it is applicable also to according to source of thermoelectron further image formation equipment applicable not only to a surface conduction type electron emission element but cold cathode electron sources, such as an MIM type electron emission element and a field emission type electron emission element, as an electron emission element.
[0054]
[Example] Hereafter, an example explains this invention still in detail.
[0055] The examples which express the feature of example 1 this invention well are above-mentioned drawing 1 - drawing 3 . Drawing 1 is the plan of a display-panel unit, and drawing 2 is AA cross section of display-panel unit drawing 1 . In these drawings a display-panel unit and 10 1 A display panel, The image formation section on the front board with which 2 consists of

blue sheet glass, and the front board 2 with which, as for 20, the fluorescent substance is formed, The electron emission element section on the tooth-back board with which 3 consists of blue sheet glass, and the tooth-back board 3 with which the electron emission element of the above-mentioned [30] is formed, The frame with which 4 consists of blue sheet glass, the wiring with which 5 consists of a flexible substrate, the electrical circuit substrate in which the electrical circuit to which 6 drives an electron emission element is formed, heat conduction which consists of grease for electrical parts, such as electrical parts, such as a transistor to which 7 generates heat at the time of an electron emission element drive, and a voltage reference in which, as for 8, others do not generate heat comparatively, and 9 telling the heat of an electrical part 7 efficiently to a tooth-back board -- it is a member

[0056] Where positioning with relative front board 2 and tooth-back board 3 is performed, it seals by the glass frit through a frame 4, and it becomes the form of the display panel 10 which is an airtight container. It is prepared in the interior of a display panel 10 so that the electron emission element section 30 may counter on the image formation section 20 and the tooth-back board 3 on the front board 2. The electrical part 7 which generates heat on the electrical circuit substrate 6 is mounted outside the electron emission element section 30, and the other electrical parts 8 are mounted inside. the mechanical connections of the electrical circuit substrate 6 and a display panel 10 -- the portion of an electrical part 7 -- setting -- heat conduction -- it carries out by the member 9 and wiring 5 performs electrical installation of the electrical circuit substrate 6 and a display panel 10 The display unit 1 is held into a tank and image formation equipment is done.

[0057] Drawing 3 is drawing showing the display panel of the above-mentioned display-panel unit, and the relation of an electrical circuit substrate, 10 is an electrical part to which a tooth-back board and 4 generate heat in the image formation section and 3, and an electrical circuit substrate and 7 generate heat [a display panel and 2 / a front board and 20] in a frame and 6, and 8 is other electrical parts.

[0058] The display panel 10 is formed from the front board 2, the tooth-back board 3, and the frame 4, and the image formation section 20 is formed in the interior on the front board 2. The electrical part 7 which generates heat on the electrical circuit substrate 6 is installed in a periphery, and the other electrical parts 8 are installed inside. A display panel 10 and the electrical circuit substrate 6 are assembled like drawing 2 . The heat conductive guide members 9 (un-illustrating) are inserted between an electrical part 7 and the tooth-back board 3 of a display panel 10 in that case.

[0059] The driving signal of image formation equipment is transmitted from the electrical circuit substrate 6 to the electron emission element section 30 on the tooth-back board 3 of a display panel 10 through wiring 5, an electron is emitted from an electron emission element, and a picture is formed in the image formation section 20. When image formation equipment was driven, within the tooth-back board of a display panel, the heat of the electron emission section and the heat of an electrical part 7 which are generated with a drive were mostly distributed over homogeneity, and generating of a thermal strain was not seen.

[0060] In addition, the gestalt of an electrical circuit substrate is not limited to this example, may be made the composition of two or more electrical circuit substrates which mounted electrical parts 7 and 8 separately, and can be suitably chosen according to the function.

[0061] It explains using drawing drawing 4 and drawing 5 as the second example which expresses the feature of example 2 this invention well. Drawing 4 is the plan of a display-panel unit, and drawing 5 is BB cross section of display-panel unit drawing 4 . In these drawings a display-panel unit and 10 1 A display panel, The image formation section on the front board with which 2 consists of blue sheet glass, and the front board 2 with which, as for 20, the fluorescent substance is formed, The electron emission element section on the tooth-back board with which 3 consists of blue sheet glass, and the tooth-back board 3 with which the electron emission element of the above-mentioned [30] is formed, The frame with which 4 consists of blue sheet glass, the wiring with which 5 consists of a flexible substrate, the electrical circuit substrate in which the electrical circuit to which 6 drives an electron emission element is formed, heat conduction which consists of a paste for electrical parts, such as an electrical circuit substrate in which the electrical part to which 60 generates heat is carried, and IC in which 7 generates heat at the time of an electron emission element drive, and 8 telling the heat of an electrical part 7 to electrical parts, such as a digital disposal circuit, and 9 telling it to a tooth-back board efficiently -- it is a member

[0062] Where positioning with relative front board 2 and tooth-back board 3 is performed, it seals by the glass frit through a frame 4, and it becomes the form of the display panel 10 which is an airtight container. It is prepared in the interior of a display panel 10 so that the electron emission element section 30 may counter on the image formation section 20 and the tooth-back board 3 on the front board 2. The electrical part 7 generating heat is mounted on the electrical circuit substrate 60, and other electrical parts are mounted on the electrical circuit substrate 6. the electrical part 7 on the electrical circuit substrate 60 -- tooth-back board 3 outside and frame 4 of a display panel 10 -- heat conduction -- it is in contact through a member 9 Wiring 5 performs electrical installation of the electrical circuit substrates 6 and 60 and a display panel 10. The display unit 1 is held into a tank and image formation equipment is done.

[0063] The driving signal of image formation equipment is transmitted from the electrical circuit substrates 6 and 60 to the electron emission element section 30 on the tooth-back board 3 of a display panel 10 through wiring 5, an electron is emitted from an electron emission element, and a picture is formed in the image formation section 20. When image formation equipment was driven, within the tooth-back board of a display panel, generating of the thermal strain from which the heat of the electron emission section and the heat of an electrical part 7 which are generated with a drive are mostly distributed over homogeneity, and pose a problem was not seen.

[0064] In addition, the material of each component part is not limited to the above-mentioned example, to a front board, heat-conduction rubber etc. is raised to heat-conduction members, such as glass and ceramics, at frames, such as glass, and glass,

ceramics, etc. can choose it suitably at a tooth-back board according to the function.
[0065] Moreover, if a margin is in the installation of equipment, the composition which uses together a conventional radiation fin and a conventional air-cooling fan is also possible.
[0066]
[Effect of the Invention] Since a thermal strain does not occur in a display panel in the image formation equipment of this invention as explained above, the curvature of a panel can be pressed down and reliable image formation equipment can be offered. Furthermore, since it is necessary to attach neither a radiation fin nor an air-cooling fan, the thin-shape[the miniaturization and]-ized image formation equipment can be offered.

[Translation done.]